

REMARKS

Claims 4, 9 and 12 stand rejected under 35 USC 112 for indefinite limitations/ statement of range claiming. Claims 4, 9, and 12 have been amended to overcome this § 112 rejection. The alternate range/ limitations recitations have been recited in new claims 16 - 19. No new matter has been added. The progression of ranges and limitations now recited by amended claim 4, 9, and 12, and new claims 16 - 19 does not violate 35 USC 112.

Claims 1 - 3, 5 - 8, 11, 12 are rejected 35 USC 102(b) as anticipated by Hanley (US 5,114,992). In order for Hanley to anticipate applicant's apparatus claims 1 - 3 and 5 - 8, Hanley must teach the entire structure (every element) assembled in the same structural relationship as the present invention. Hanley does not. Likewise, in order for Hanley to anticipate applicant's method claims 11 and 12, Hanley must teach every step and in the same order as the present invention. Hanley does not. Therefore this rejection is TRAVERSED.

Claims 1-9 and 11 and 12 stand rejected under 35 USC 102(b) as anticipated by Guerrini (US 5,362,431). In order for Guerrini to anticipate applicant's apparatus, Guerrini must teach each element and in the same structural connection as the present invention. Guerrini does not. In order for Guerrini to anticipate applicant's method, Guerrini must teach every step and in the same order as the method of the present invention. Guerrini does not. This rejection is TRAVERSED.

Claims 1 - 8 and 11 - 15 stand rejected under 35 USC 102(b) as anticipated by Saito (US 5,866,648). Again, Saito does not teach each element assembled in the same structural connection as the present invention. Again, Saito does not teach each process step performed in the same order as the present invention. This rejection is TRAVERSED.

Claim 10 stands rejected under 35 USC 103(a) as obvious in view of Hanley, or Guerrini, of Saito when any one of these is read with de Wit (US 6,221,951). This rejection is TRAVERSED.

It is well settled law that the claims of an application are to be interpreted in light of the specification and drawings. *Markman v. Westview Instruments, Inc.*, 116 S Ct 1384 (1996). It is also well settled law that any technical terms not interpreted in light of the specification and drawings are to be taken in their ordinary sense, as defined in a Technical Dictionary or other defining publication.

The Examiner is required to set forth in his Office Action: (A) the relevant teachings of the prior art relied upon, including making reference to the relevant column of page number(s) and the line number(s) where appropriate; (B) the difference or differences in the claim over the applied reference(s); (C) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter; and (D) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification. See MPEP 706.02(j). The Examiner has failed to adequately provide all of this information, and in particular item (D) above, and therefore the standing rejection of claims 58-62, 64-67, 71 and 79 is without proper foundation.

To establish a *prima facie* case of obviousness the following three basic criteria must be met: 1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to combine the specific reference(s) teachings; 2) there must be a reasonable expectation of success in combining the specific reference(s) teachings; and 3) the prior reference (or references when combined) must teach or suggest all of the claim limitations. See MPEP 706.02. The teachings or suggestion to combine and the reasonable expectation of success must both be found in the prior art and not based upon the applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed Cir

1991); also see MPEP 2143 - 2143.03 for additional decisions pertinent to each of the criteria.

The initial burden is on the Examiner to provide support for a *prima facie* case. *Ex parte Clapp*, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

In remarking on what in the prior art the Examiner has relied upon, the Examiner has failed to point out: (1) the suggestion or motivation in the references themselves or in the knowledge generally available which suggests a need or purpose for combining the specific references; (2) the reasonable expectation of success in combining the specific references; and (3) where the prior references teach or suggest all of the recited claim limitations. The Examiner has not justified a need, a purpose and a result for the combination of prior art proposed. Whereof, the Examiner has not met his specific burden of providing support for a *prima facie* case and therefore the standing 35 USC 103 rejection must be withdrawn.

Applicant believes the Examiner has misread the references and the specification of the present invention and has not applied the standards of one of ordinary skill in this art.

I. Review of the references and the present invention:

a. **Hanley (US 5,114,992)** discloses a reinforced linear alternating polymer of carbon monoxide and at least one ethylenically unsaturated hydrocarbon reinforced by the presence of glass fibers having a coating of a blocked isocyanate sizing material. (Col. 1, lines 62-67)

The ethylenically unsaturated hydrocarbon which are useful precursors of the linearly alternating polymers ... are aliphatic such as ethylene and other α -olefins including propylene, 1-butene, isobutylene, 1-hexane, 1-octane and 1-dodecene, or are aliphatic molecule, particularly an aryl substituent on a one carbon atom of the ethylenic unsaturation. Such ethylenically unsaturated hydrocarbons are: styrene, p-methylstyrene, p-ethylstyrene, or m-propylstyrene. (Col. 2, lines 11-28)

When the preferred copolymers of carbon monoxide and ethylene are employed in the reinforce polymers of the invention, there will be no second hydrocarbon present. (Col. 2, lines 44-47)

Of particular interest are polyketone polymers. (Col. 2, line 60) The reinforced polymers of the invention are reinforced by glass fibers. Glass is taken in its conventional meaning as a complex metal silicate. (Col. 3, line 51-55) This is common glass containing oxides of aluminum, calcium, boron, or magnesium. (Col. 3, lines 58-60).

Lengths of the glass fiber range from 0.1 inch to about 0.5 inch, with shorter or somewhat longer lengths being satisfactory. Too long a length detracts from the processability of the polymer-class mixture, while too short a length does not provide desired strength. (Col. 4, lines 16-21) A range of 0.1 to 0.5 inches equates to 2.54 to 12.7 mm.

Glass fibers used for reinforcements for polymeric materials will customarily be provided by the manufacturer of the fiber with a coating of sizing material or coupling agent in place. The nature of the sizing or coupling agent will influence the interfacial shear strength of the fiber and the polymer matrix, i.e., the degree to which the polymer and the glass fibers will adhere. (Col. 4, lines 27-34)

The glass fibers used in the reinforced polymers of the Hanley invention are those identified as blocked isocyanate size. (Col. 4, lines 53-55). These isocyanates are well known being used in polyurethane production, such as methylenediisocyanate (MDI), toluenediisocyanate (TDI), 1,4-bis(isocyanatomethyl)cycloheane, isophoronediisocyanate and polymeric materials including copolymers of 2-cyanatoethyl methacrylate and styrene. (Col. 4, lines 59-65) Blocking agents employed include caprolactam, phenol and acetone oximes.

The method of producing the reinforce polymers of the Hanley is not critical so long as an intimate mixture of the polymer and glass is obtained without undue degradation of the components or resulting mixture. (Col. 5, lines 12-15) In one embodiment, the polymer and

the glass fibers are dry mixed and converted to an intimate mixture by application of elevated temperature and pressure. In an alternate embodiment, the components are passed through an extruder to produce the mixture as an extrudate. The components are also mixed in a blender or similar mixing device which operates at elevated temperatures and high shear. (Col. 5, lines 16-23)

Embodiment illustration I - mixture of linear alternating terpolymer of carbon monoxide, ethylene and propylene and a commercial fiber extruded through a twin screw feeder. The fibers being sized with one of: epoxy, polyurethane/ epoxy, polyurethane, acrylate/ peroxide, blocked isocyanate. (Col. 6, lines 1-22) Glass fibers are in the range of 1% to 45% by weight, with 10% to 35% being preferred. (Col. 5, 6-10)

In each of the embodiment illustrations the polymer being reinforce was a polykeytone polymer being a linear alternating terpolymer of carbon monoxide, ethylene and propylene. (Col. 6, lines 39-41)

Hanley has made a fiberglass reinforced styrene where the fiberglass fibers are pre-sized with a layer of one of: epoxy, polyurethane, acrylate over peroxide, or an exotic blocked isocyanate. Hanley's base material is not equivalent to applicant's. Hanley's sizing Markush group is not equivalent to applicant's.

Hanley suggests his fibers can be within a range of 2.54mm to 12.7mm without any discussion of why. In fact, he merely states that somewhat longer and somewhat shorter lengths are also satisfactory, wherein too long a length of glass fiber detracts from the processability of the polymer-glass mixture, while too short a length does not provided the desired strength. (Col. 4, lines 16-21).

Similarly, Hanley specifies his fiber diameter in the broad range of 5 microns to 20 microns. He states he prefers 8 to 15 microns, but does not state why. Lastly, his example uses glass that is 13 microns in diameter. (Col. 4, lines 6-9, and Col. 6, line 10).

The fact is that Hanley concerns himself with a homogeneous molded product and has accepted fiber lengths specified in literature for molding machine sizes and molded part size and function.

Hanley is silent on the temperatures at which he extrudes and blends. However, he concerns himself with the melting points of his polymers. (Col. 3, lines 4-5) One of ordinary skill would understand the elevated temperatures discussed by Hanley at column 5, lines 16-23, would exceed the melting points of all polymers involved.

b. Guerrini (US 5,362,431) discloses a process for making shaped bodies of fiber reinforced thermoplastic polymers by means of extruding, injection molding or spin molding granules made by cutting a continuous filament constituted by a bundle of fibers impregnated with a thermoplastic polymer in powder form and coated with an outer sheath of a thermoplastic polymer which is the same or different from the powdered polymer and having a melting point equal to or higher than the powdered polymer. (abstract)

Guerrini's goal is to provide a homogeneous distribution of the fibers in the end article of manufacture. (Col. 2, lines 6-8) He teaches a process for making elongate pellets of thermoplastic coated fiberglass in which the thermoplastic matrix is a blend of two polymers. (Col. 2, lines 47-51 and Col. 4, lines 15-19).

Guerrini coats purchased glass fibers (Owens Corning Fiberglass with count of 2400 tex meaning there are 2400 filaments in a strand). (Co. 4, lines 35-36) with a powdered polymer. He then coats the powdered glass fibers with a second thermoplastic polymer to form a sheath which is equal to or different from the powdered polymer and has the same or higher melting point as the powdered polymer. (Col. 2, lines 63-68) Guerrini then calenders the resulting filament at approximately equal to the powdered polymer softening temperature. (Col. 3, lines 1-3). Guerrini states that any kinds of thermoplastic polymers can be used for the powder and the sheath. (Col. 3, lines 13-15) He then goes on to recite about 30 different types of

thermoplastic polymers, all of which he could not have tested for suitability. (Col. 3, lines 15-32).

When in fact Guerrini gives only one specific example for his polymers, that being polyamide-6 for his powder, being provided by Autochem as Orgasol® and polyamide for his sheath, being provided by Atochem as RILSAN®. (Col. 4, lines 31-34). Guerrini cites one comparison example out of the prior art, where the powder was also polyamide-6 and the sheath was polyethylene sold as Eraclene PG55®.

The fact is that Guerrini's laundry list of thermoplastic polymers has never been tested and is mere speculation.

Guerrini heats his sheathed powdered roving to a temperature that will soften his powdered polymer, and generally only up to the glass transition temperature and not above, and at most to the melting point of the powder, if the powder is crystalline and not amorphous. (Col. 4, lines 1-10) This means that he is affecting a mechanical bonding of his sheath to his powdered roving by having his powder "flow on the fibers". Guerrini does not intend to have a mixture of his powdered roving and his sheath. His sheath is always on the outside as an outer covering, i.e., a sheath.

Guerrini states that the steps of his process for making his product are carried out according the US patent no. 4,614,678. (Col 3, lines 39-41). This patent (US 4,614,678) issued to Ganga and is incorporated into the Guerrini disclosure by reference. While Guerrini does not show a drawing of his invention, Ganga Fig. 4 shows a composite 30 being a sheath 30 covered roving 33 wherein a thermoplastic powder 32 coats the fiberglass roving 33. Clearly neither Ganga nor Guerrini show a mixture.

Guerrini states that his manufactured pellets can have a length in the range of 2mm to 100mm. (abstract, and Col. 3, lines 5-6) This range is much broader than that suggested by Hanley. Guerrini later qualifies that his preferred range for fiber containing pellets length is 2 to

15 mm. (Col. 4, lines 16-17) This is closer to the Hanley preferred range of 8 to 15mm. Guerrini, in specifying these lengths, Guerrini states that those lengths are chosen for a pellet are for good processability characteristics for injection molding, extrusion molding and spin molding. (Col. 4, lines 18-20)

Guerrini, like Hanley, concerns himself with a homogeneous molded final product (homogeneous polymer matrix) and that his goal is also to have a long-fiber composite.

It has been long settled in the molding art that two short of a length for the fiber causes them to mechanically act similarly to particulate matter in concrete, where longer fibers act like similarly to reinforcing rod in concrete. Fibers become too long for the size of the molding machine and its nozzles and extruder passages are undesirable. Thus the upper limit for the fiber length is dependent upon product and molding machine sizing.

Guerrini carries out his molding at temperatures high enough to melt all of his polymers and at a mixing revolution of 20 rpm. (Col. 4, lines 60-64)

c. **Ganga (US 4,614,678)** shows his manufacturing steps/ apparatus Figs. 1, 2. Fig.2 shows a detail of the output end of Ganga's equipment. Ganga (and therefore Guerrini) runs his roving 11 through a sealed tank of powdered thermoplastic 5 which is "fluidized" by compressed air 6. His roving 11 is spread out during its transit in the tank and the powder clings to the roving strands under an electrostatic charge. (Ganga Col. 2, lines 63-65; Col. 3, lines 24-28; Col. 3, lines 49-51). At the output end the powdered roving is heated and plastic sheathing is applied in the cross head 9 by an extruder 10. The sheathing material 31 cools after it leaves the extruder and shrinks about the powdered roving. (Ganga Col. 3, lines 37-38; Col. 4, lines 8-18). The composite 30 has a flexible sheath 31 covering roving 33 of fibers impregnated with thermoplastic powder. (Ganga Col. 4, lines 25-27) There is no mixture disclosed by either Ganga nor Guerrini.

Ganga does not address fiber length, but one of ordinary skill would understand that a range compatible with the extruder die, mandrel and cylinder dimensions specified by Ganga would be needed.

Ganga is silent on his process temperatures, but expressly states that his machine applies the powdered thermoplastic to his fiber roving without turning it to "gel" and then avoids melting the powdered thermoplastic. The molten sheath is applied without melting the powder. (Col 3, lines 14-16, and lines 40-41, and 68, and Col. 4, lines 1-2 and 10-16)

d. **Saito (US 5,866,648)** teaches a complex polymer alloy resin composition which has fiber reinforcement mixed with a diluent. A "master batch" known as component (A) is prepared from a polyamide resin with long fiber reinforcement. Component (A) is mixed with component (B) which is a "diluent" made from polymer-alloyed resin. (abstract and Col. 2, lines 32-38). The diluent is made by melt kneading a crystalline polyolefin, containing an unsaturated carboxylic acid modified olefin crystalline polymer, with a polyamide resin. (Col. 2, lines 49-54) The fiber reinforcement is in the range 10% to 60% by weight of the final mixture. The polyolefin resin is in the range of 20% to 45% by weight. (abstract)

The Saito long fiber-reinforced polymer alloy is obtained by blending a specific master batch with a specific resin diluent. A "diluent" is a non-reactive inert substance that is added to another substance or solution to increase volume. There is no chemical bonding. There is no chemical function between the diluent and the Saito master batch containing the fibers. There is no distinction between a "diluent" and an extender.

The Saito master batch (A) comprises a polyamide resin matrix with a long fiber reinforcement. (Col. 3, lines 33-37) The polyamide resin can include: polyamide-6 (PA 6), polyamide-11 (PA 11) and polyamide-12 (PA-12); a co-condensed polymerization type resin: polyamide 6,6 (PA 66), polyamide-6,10 (PA 610), polyamide 6,12 (PA 612) and MXD 6

prepared from m-xylenediamine and adipic acid; or composites and mixtures of these. (Col. 3, lines 43-51).

Saito's fibers are roving which has a bundle of 500 to 6,000 monofilaments. (Col. 4, lines 15-20) The roving is impregnated with the molten polyamide as its individual stands are loosened (spread out) and brought into contact with the molten polyamide. This is followed by a taking up of the strands. (Col. 4, lines 33-35 and lines 41-46). On cooling the coated stands are chopped into pellets. (Col. 4, lines 46-49)

Saito's resin diluent (B) is a polymer-alloyed obtained from crystalline polyolefin resin and polyamide. The crystalline polyolefin is an olefin crystalline polymer. The entire crystalline polyolefin resin may be modified olefin crystalline polymer. The modifying is done with an unsaturated carboxylic acid or its anhydride serving as a modifier. (Col. 4, lines 65-67 and col. 5, lines 1-8)

Saito's modified olefin crystalline polymer having been substantially modified with unsaturated carboxylic acids may be a single substance of a modified propylene crystalline polymer obtained by graft reaction of a crystalline polyolefin resin with a modifier or may be a mixture of the modified propylene crystalline polymer and an unmodified crystalline polypropylene resin. (Col. 5, lines 9-14)

Saito suggests polymers used as bases for the modified crystalline polymer to include polyethylene, polypropylene, poly-1-butene and poly-4-methyl-1-pentene. The olefin polymer used as a starting material of the modified crystalline olefin polymer or used as the unmodified olefin crystalline polymer is preferably a crystalline homopolymer or a crystalline copolymer of two or more olefins. (Col. 5, 15-21)

Saito unsaturated carboxylic acids serving as modifiers can be: acrylic acid, methacrylic acid, maleic acid, itaconic acid, tetrahydrophthalic acid, or norbornenedicarboxylic acid; and at

least one anhydride such as: maleic anhydride, itaconic anhydride, tetrahydrophthalic anhydride, or norbornenedicarboxylic anhydride. (Col. 5, lines 23-29)

The Saito diluent (B) is any modified olefin crystalline polymer as long as it is substantially chemically reacted with the polyamide resin so as to be polymer-alloyed. The modified olefin crystalline polymer may be another modified olefin crystalline polymer having been modified with unsaturated carboxylic acids, for example, an ionomer resin, or it may be a polymer having in addition to the carboxyl group a group which is another polar group than the carboxyl group and is able to be linked to at least one of the amino group and the carboxyl group. (Col 5, lines 34-44)

In the Saito diluent (B) the crystalline polyolefin resin and the polyamide resin are melt kneaded to substantially form a chemical linkage between the modified propylene crystalline polymer and the polyamide resin. This produces the Saito polymer-alloyed resin diluent. (Col. 5, lines 56-60)

Saito purchases his master batch pellets (A) from Toray Industries, Inc. under the trade name CM 1007. This product has PA 6 as the polyamide resin and glass roving of 4,000 filaments in a strand with tex yarn number count of 2,310 grams per kilometer. The roving is provided by Nippon Electric Glass Co., Ltd. (Col. 8, lines 24-30)

Saito extrudes his modified propylene crystalline polymer, which was obtained by graft reaction with maleic anhydride, with PA 6 where they are melt kneaded at 250 °C to substantially form a chemical linkage there between in order to provide the polymer-alloyed resin diluent (B). The resin diluent (B) is extruded and cut to length to form pellets. (Col. 8, lines 31-39)

The two types of pellets (A) and (B) are dry blended and used for molding. (Col. 8, lines 42-45)

Saito specifies his fibers / pellets to have a length of 3 to 30 mm, with more preferably a range of length of 9 to 20 mm. The length of the pellet is the length of the chopped roving.

(Col. 4, lines 46-48)

Saito provides one example where he makes a two-phase (sea-island) structure consisting of an island of polyamide resin in a polypropylene resin matrix. Saito's polypropylene resin matrix is homogeneous. The two-phase structure is created by Saito's diluent, polyamide resin (B) which forms an island in the polypropylene resin matrix (A). However, Saito teaches away from this example because the molded article obtained from the final composition (C) is barely improved in mechanical strength and repeated impact resistance properties. (Col. 6, lines 39-42 and lines 52-55)

Saito's master batch polymer (A) is molten when applied to his fiber roving. (Col. 4, lines 33-38) Saito makes his master batch (A) fiber reinforced matrix in a "molten" extrusion process. (Col. 8, lines 14-18). Saito makes his diluent (B) by melt kneading in an extruder. (Col. 8, lines 35-38).

Saito molds his master batch pellets (A) and his diluent pellets (B) into a product (C) in an injection molding machine at temperatures sufficient to melt the pellets (A) and (B). (Col. 8, lines 42-45).

e. **de Wit (US 6,221,951)** teaches a polyketone composition of a blend of polyketone and glass fibers having a coating composition thereon having an acrylic functionality. The coating composition is styrene-acrylonitrile copolymer or blends thereof. (Abstract)

The de Wit ketone polymer of an alternating or random type formed from carbon monoxide and at least one unsaturated compound and fibers which have been treated with an acrylic functionality. (Col. 2, lines 11-15)

The de Wit blend of the ketone polymer and the glass fibers are prepared by blending and heating the ketone polymer and glass fibers into a homogenous, melt blend. The blended

composition is formed into finished articles by extrusion, injection molding, compression molding or blow molding. (Col. 2, lines 17-24)

The de Wit polyketones comprise an alternating structure which contain substantially one molecule of carbon monoxide for each molecule of unsaturated compound. Suitable unsaturated compounds are aliphatic such as ethylene and other α -olefins including propylene, 1-butene, isobutylene, 1-octene and 1-dodecene, or are arylaliphatic, cycloaliphatic or olefinic compounds containing an aryl substituent or containing acrylic, acetate and the like. These could include: styrene, p-methylstyrene, p-ethylstyrene or m-isopropylstyrene, acrylonitrile, methyl methacrylate and the like. (Col. 2, lines 33-48)

de Wit uses "E glass" as his fiber material, which may be individual fibers or bundled into yarns, rovings or mats. (Col. 3, lines 17-19 and lines 29-31). The de Wit fibers are treated to improve bonding with the polyketone. Sizing is alkoxy silanes including: amimopropyl triethoxy silane, glycidoxyl propyl trimethoxy silane, (3,4-epoxy cyclohexyl) ethyl triethoxy silane, mercaptopropyl silane, aminoethyl aminopropyl alkoxy silane and uredioalkyl triethoxy silane. (Col. 3, lines 39-46). These are all silicon based compounds.

The de Wit sizing can also contain film forming additives such as starches, epoxy resin, polyvinyl acetate, unsaturated polyesters, polyurethane, polyvinyl pyrrolidone, phenoxy resins, poly vinyl ether copolymers and the like which must be stable under melt processing. (Col. 3, lines 50-56)

de Wit's preferred process uses roving or a bundle of strands of glass filaments which are pretreated with an agent and then chopped into small pieces. (Col. 4, lines 6-9). The treated chopped fibers are fed into an extrusion compounder with the polyketone to produce molding pellets. (Col. 4, lines 6-13) In de Wit's alternate process, glass filaments are ground or milled into short lengths treated with the acrylic functional composition, and then mixed with the

polyketone resin by dry blending, and thereafter are either fluxed on a mill and ground or extruded and chopped to produce molding pellets. (Col. 4, lines 13-16)

In de Wit's third embodiment, glass roving is pretreated with the acrylic functional material and then drawn through a melted polyketone bath which coats the roving. The polyketone coated roving is then chopped into molding pellets. (Col. 4, lines 17-23)

For his examples, de Wit produces his polyketone by dry blending a keyton terpolymer of ethylene, propylene and carbon monoxide having a melting point of 220 °C. De Wit chooses his coating composition from the group of: acrylic, SAN-acrylate copolymer, epoxy, polyurethane/ acrylate, polyurethane/ epoxy, polyurethane, SAN, SAN-methacrylate. (Col. 5, lines 13-15 and lines 35-42, and col. 6, lines 8-12).

de Wit is silent on fiber / pellet length. He is also silent on the homogeneity of his resin matrix which must be assumed homogeneous.

de Wit is concerned with the melting points of his polymers. (Col. 1, lines 16 and 54-56) de Wit melts his polymers and melt molds his pellets to produce his product. (Col. 5, lines 15, and 19-20, and 20-21, and 25-26)

f. The present invention departs from this prior art. Applicant creates a long-fiber reinforced plastic and method of production of same, which offers a broad possibility for variations with respect to the mechanical, chemical and electrical properties achieved for the molding material. (Pg. 2, lines 14-17)

The matrix of the material consists of two different thermoplastics wherein the fibers are wetted essentially only by one of the two thermoplastic materials. At least 80% of the fibers or fiber surfaces are wetted with the first of the two thermoplastics. (Pg. 2, lines 21-26)

The first thermoplastic is selected for good wetting capability and impregnation capability and the second thermoplastic is selected for the physical, chemical or electrical properties desired in the end product. (Pg. 2, lines 31-34)

The first thermoplastic material essentially only forms the binding member between the fibers and the second thermoplastic material (Pg. 9-12). The mixture of the two thermoplastic materials is homogeneous. (Pg. 3, lines 21-22). The fibers are glass, carbon, aramide or natural such as flax, hemp or jute.

The first thermoplastic (wetting material) is selected from the group: polypropylene, polyamide (PA 6, PA 66, PA 12, PA 46), polyethylene, acrylonitrile/butadien/styrene copolymers, polyphenylene, sulphide, polystyrene, and polyether-ether ketone. (Pg. 3, lines 32-34 and Pg. 4, lines 1-2)

If the two thermoplastics are poorly miscible or immiscible (do not dissolve in each other, i.e., poor chemical bonding) and form an inhomogeneous mixture, then the inhomogeneities should be relatively low, e.g. less than the typical length of the fibers, whereby the fibers bridge the inhomogeneous areas. (Pg. 4, lines 4-9)

First embodiment the first material is polypropylene and the second material is a polyamide such as PA 66 wherein the polypropylene portion is 10-40% and the PA portion is 60-90%. (Pg. 4, lines 16-22)

Fiber length is 3 to 6 mm. The fibers are supplied in a skein or matting. (Pg. 5, lines 6-8)

In applicant's first embodiment process, the fibers are extruded with the first thermoplastic material and then cooled. The coated skein (thread or yarn-like) fibers are then extruded with the second thermoplastic material and then cooled. (Pg. 5, lines 10-14) This material can be chopped into molding pellets.

In applicant's second embodiment process, the skein fibers are extruded with the first thermoplastic material and then cooled. The material is then chopped into pellets having an average length of at least the average length of the fibers in order not to shorten the fibers. These pellets are then mixed with the second thermoplastic material to form a molding mixture. (Pg. 5, lines 15-22)

Molding by extrusion, blow molding or injection molding wherein the mixture is brought to the melting point or slightly above the melting point of the faster melting substance for a short time only. This may provide a non-homogeneous mixture, wherein the inhomogeneous areas are small in size compared with the length of the fibers which bridge the inhomogeneous areas. (Pg 5, lines 25-31)

However, after applicant's first impregnation and extrusion step, the long-fiber material that occurs consists only of the fibers and the first thermoplastics material thickly coating the fibers. This material is then broken down into pellets forming little rods. These pellets are then mixed with applicant's second thermoplastics material and then heated again and then extruded in order to produce a thorough bond between the first thermoplastics material and the second matrix material. (Pg. 6, lines 25-34)

Thus applicant's the molded material can be inhomogeneous on a microscopic scale while also homogeneous on a macroscopic scale due to the fact that the inhomogeneous areas are bridged as their resulting dimensions are smaller than the dimensions of the individual pellets formed from the fibers and the first thermoplastic material. (Pg 6, lines 31-34 and Pg. 7, lines 1-3)

One of ordinary skill would understand that if only one of the thermoplastics melts a mechanical bond could result. However, a thorough bond implies a chemical bond and a linking, which would only occur if both of applicant's thermoplastics are melted in applicant's second extrusion step.

II. The present invention departs from the prior art:

Hanley is directed to the reinforcement of polyketones. The sizing materials according to Hanley are available on most of the commercially available glass fibers, and are definitely not the matter to which the present invention is directed. In fact, the present invention can also

employ those commercially available sizing coated glass fibers in an alternate embodiment, wherein in the present inventive thermoplastic coatings are applied over the sizing layer to become a wetting coating for which function the sizing was not capable.

The sizing materials, according to Hanley, are applied on the fibers in minor amounts to provide a thin sizing film on the fibers. The Hanley concentration of this sizing material in the reinforced fabrics is minimal, because it is a mere "film".

In contrast, applicant's wetting coating is applied in considerably greater amounts (preferably in the range of 10% to 40% by weight.)

According to Hanley, the lengths of the fibers employed in his process are from about 0.1 to about 0.5 inch (2.5 - 12.7 mm). However, the method taught by Hanley is the "twin-screw" feeder process, in which as known by one of ordinary skill, the resultant fiber length after processing is usually between 0.2 to 0.3 mm, due to the mechanical working of the machine. That is to say that the Hanley patent, when read by one of ordinary skill, is understood to be directed to the short-fiber reinforced thermoplastics product/ process, and therefore does not affect the novelty of the long-fiber reinforced thermoplastics fabrics (product/ process) of the present invention. The Hanley structure and process steps neither anticipate nor suggest applicant's claimed invention. There is no equivalency between any of the Hanley steps and the Hanley product and that of the present invention.

In Guerrini, while some similar raw materials are employed compared to the present invention, the process steps and processing sequence clearly differs. In a first step of the Guerrini process, a polymer powder is applied to the fibers. In the method of the present invention the impregnating material is not applied as a powder, but by melt extruding. These steps are not equivalent.

In a second step of the Guerrini process, a second polymer is coated on (over) the powdered fibers (fiber bundle). Thereby the Guerrini fiber bundle is provided with a continuous

outer sheath, as a substantial feature of the Guerrini teaching. The Guerrini outer sheath is distinct and separate from the Guerrini inner powder coated fiber bundle. This teaches away from the product of the process of the present invention. Guerrini teaches away from the direction of character of the present invention.

Guerrini then conducts a subsequent calandering process in which the temperature is increased to a level at which only the polymer powder inside the sheath formed by the second polymer is melted. It is an elementary principle of the process according to Guerrini that the outer sheath does not melt at the temperatures applied in the calandering process. Therefore, the materials employed in the process must be coordinated such that the melting point of the inner material is always lower than the one of the outer material.

In the present invention, applicant's second polymer forms a mixture with the first polymer of the pre-coated fibers (i.e., coated fiber pellets/ coated cut fiber strands). Applicant conducts no calandering step. Applicant's process steps and his use and purpose for his polymers is not equivalent to that taught or suggested by the prior art, including Guerrini.

In contrast to Guerrini, in the present invention the temperature in applicant's second extrusion process must exceed the highest melting temperature of the particular matrix polymers (second polymer) employed. That is to say, it is understood that to achieve the thorough bond in the present invention, all polymer compounds are heated to temperatures above their respective melting points.

Guerrini does not intend for there to be a mixture of his sheath polymer and his powdered polymer coating his fiber bundle. Thus, there is a limitation to combinations of materials in the process of Guerrini. Additionally, due to the different temperatures applied, the resulting product from the Guerrini process and the resulting product from the present invention clearly depart from one another both in quality and in mechanical and chemical properties.

In Saito, as is in one embodiment of the present invention, the fibers are coated with a first polyamide and cut into pellets after cooling. Subsequently, in Saito, the fiber-reinforced pellets are intermixed with a second polymer or polymer mixture. However, Saito expressly defines his first polyamide coated fibers as a DILUENT. A diluent is an extender. There is no chemical bonding or linking taught or suggested by Saito between the Saito "diluent" and his second polymer.

The patent to de Wit was published after the filing date of the present application. de Wit discloses the pre-treating of glass fibers with fiber treating materials to improve the bonding between fibers and the matrix polymer. As fiber treating materials de Wit uses materials with acrylic functionality and as the outer matrix for reinforcing the glass fibers de Wit applies polyketones (col. 4, l. 27-29). The fiber treating material applied is preferably a film former (col. 4, l. 47-49) that forms a film on the fibers and thereby improves the bonding of the matrix polymer to the fibers.

In contrast to de Wit, the present invention employs a multi compound matrix comprising at least two matrix compounds, of which only one is capable of bonding to the fibers.

The fiber treating material according to de Wit is applied on the fibers in minor amounts to provide a thin film on the fibers. The final concentration of the fiber treating material in the reinforced fabrics of de Wit is of necessity substantially below 10 % by weight. In the present invention, the polymer with the good fiber wetting properties is a part of the polymer matrix in amounts of more than 10 wt%, preferably in a range from 10% to 40% by weight. Thus, the teachings of de Wit and the present invention define two distinctly different methods and structural relationships.

The advantage of the present invention is that two matrix materials can be chosen appropriately with respect to their individual properties, one of which may provide improve tensile strength and the other rigidity of the resulting compound. A film "former" as

"compatibilizer" according to de Wit is not comparable to the improved matrix composition provided by the present invention.

III. Conclusion:

The prior art departs, individually and collectively, from the present invention. Neither the entirety of the exact elements nor the entirety of the inter-connection/ inter-reaction of elements of the present invention is taught or suggested by the cited prior art, either individually or in combination. The same is true with the process steps and the order of process steps of the present invention.

For these and all of the above, the standing § 102(b) and § 103(a) rejections cannot be sustained and must now be withdrawn. However, applicant has chosen to amend the apparatus/ product independent claim 1 and the process independent claim 11.

It is requested that the case be re-examined and passed to issue with the claims presented herein above.

Date: 4/8/04

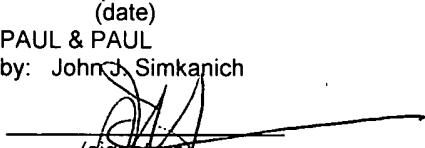
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